

# *Modular Open Systems Approach Review Team (MOSART)*

## **“Plug & Fight”**

*Hosted by  
Open Systems Joint Task Force*

*29 September 2004*

# Agenda

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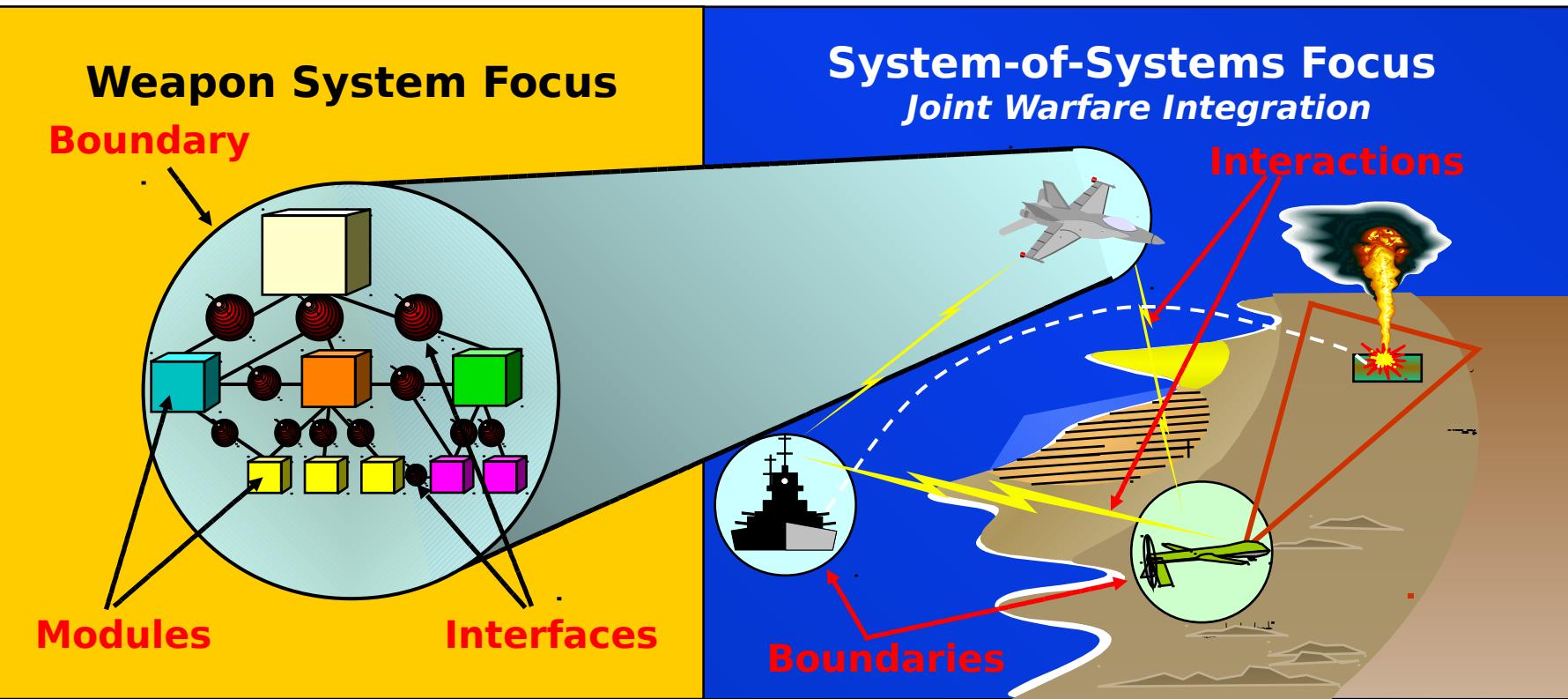
- **SoS Integrated Architecture modeling initiative - COL Flowers**
  - “Plug & Fight”
  - SoS Workshop Feedback
  - CADM XML to AP233 information transfer discussion
- **Weapon Systems Domain Standards Committee Update - Dan Feliciano**
  - Results of last standards committee meeting
    - An opportunity for Services to impact standards disposition
- **MOSA Assessment Update - Lt Col Telford**
  - Current Schedule
  - USMC EFV MOSA Assessment Feedback - PM EFV
- **Discuss OSD and Navy Open Architecture Corporate Policies**
  - Explore instantiating similar policy in Army, AF, and

# Joint Integrated Warfare..... “Plug & Fight”



- MOSA is becoming standard practice for individual systems
- However, Joint Integrated “Plug & Fight” capability cannot exist without standard architecture descriptions at all system levels
  - Requires DoD and Industry commitment to develop well defined, non-proprietary architectures
- Resulting architectures will be ‘open & transportable’, thereby enabling the ad-hoc nature of ‘plug & fight’
  - Consistent
  - Precise & Unambiguous
  - Executable
  - Modular & Scalable
  - Technology or implementation neutral
  - Tool independent, yet shareable
  - Based on industry standards
- Application of MOSA principles is the surest way to ensure that open & transportable architectures are developed –  
**OSJTF is chartered to make this happen**

# Applying MOSA to the Joint Fight



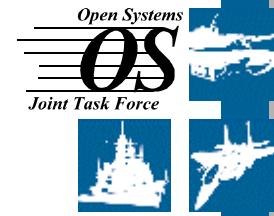
**Plug & Fight**

*"I expect the Task Force to play an important role in achieving joint architectures by applying a modular, open systems approach at the system-of-systems level."*

Source: PDUSD(AT&L) Memo of December 18, 2002

Subject: Extension of the OSJTF

# Architecture Modeling Initiative

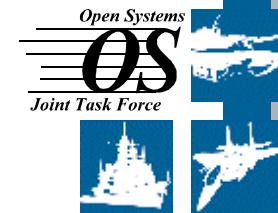


- Objectives
  - Determine if it is viable to **describe** executable models of SoS architecture views that
    - Satisfy stakeholder requirements
      - Warfighters, Program Managers, Developers, Vendors, Integrators, Testers, Governance Bodies
    - Permit views to be constructed so that they are **open & transportable**

## • **Approach**

- **Phase I** (JUN 04 – AUG 04)
  - A series of structured workshops to obtain and vet stakeholder needs and to identify best practices for modeling SoS views
- **Phase II** (SEP 04 – SEP 05)
  - Demonstrate the viability of industry modeling standards for SoS views by applying the best practices developed in the workshops to a joint integrated warfare scenario
  - OSJTF will commission this effort as a 'proof of concept'
- **Phase III** (OCT 05 – MAR 06)
  - Formalize the migration strategy, actions, timelines and milestones necessary to implement related findings and recommendations

# SoS Workshop Participants



## Government

- AF/XIW
- Army/AAIC
- Army/ASEO
- Army/BSCE (M&S Div)
- Army/CIO/G6
- Navy/PEO(IWS)
- USMC/MCCDC
- JCS/J8
- JFCOM/J87
- JFCOM/J89
- OSD/ATL/DDRE/DMSO
- OSD/ATL/DS/SE/ED
- OSD/ATL/DS/SMI/OSJTF
- OSD/NII/A&I

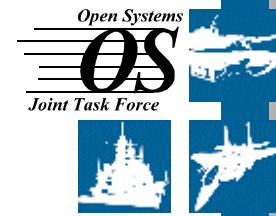
## Industry

- Advanced Concepts, Inc
- Boeing
- DRS Technologies
- General Dynamics Land Systems
- Green Hills Software, Inc
- Harris Corp
- Lockheed Martin
- Northrop Grumman
- Raytheon
- Rockwell Collins
- Vitech Corp

## Other

- NDIA/SE/M&S
- SEI
- SOSECE/CTC
- The Open Group

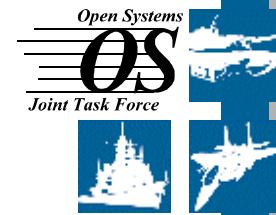
# System of Systems Integrated Architecture



## Modeling

- Problem: Modeling and Architecture communities have a plethora of proprietary approaches for modeling the System Architecture
  - ..... none of which has emerged as a dominant approach
  - The SoS construct is new and an agreed upon modeling approach has not been reached.
  - The community agrees that the solution must be COTS based and open solution is
- Open Systems Perspective: Gain consensus amongst the Architecture, M&S, Systems Engineering, Government, Industry and Academic communities and promote a singular description SoS Architecture Modeling approach
  - Implement a phased investigation of the problem
    - Gov't / Industry workshops (consensus building)
    - Proof of Concept
    - Establish DoD Policy

# **Executable SoS Architecture Modeling Workshops**



## **Preliminary Major Findings**

Must be considered

- Many Stakeholder COIs that have
  - Different needs, interests, perspectives and priorities
  - Their own 'value chains' and processes
  - Unique semantics for COI specific concepts
  - Different semantics for similar or common concepts
- Architecture models
  - Are used in multiple architecture usage and exchange scenarios
  - Candidate component systems do not easily 'plug into' SoS architecture models
  - Requirements for and characteristics of 'executable models' are still poorly understood
- Differing Opinions on whether
  - Architectures are the ends or the means
  - Architecture activities are a part of traditional systems engineering processes or separate
  - Systems engineering for SoS is significantly different than for traditional systems

# ***Executable SoS Architecture Modeling***

## ***Workshops Preliminary Conclusions***

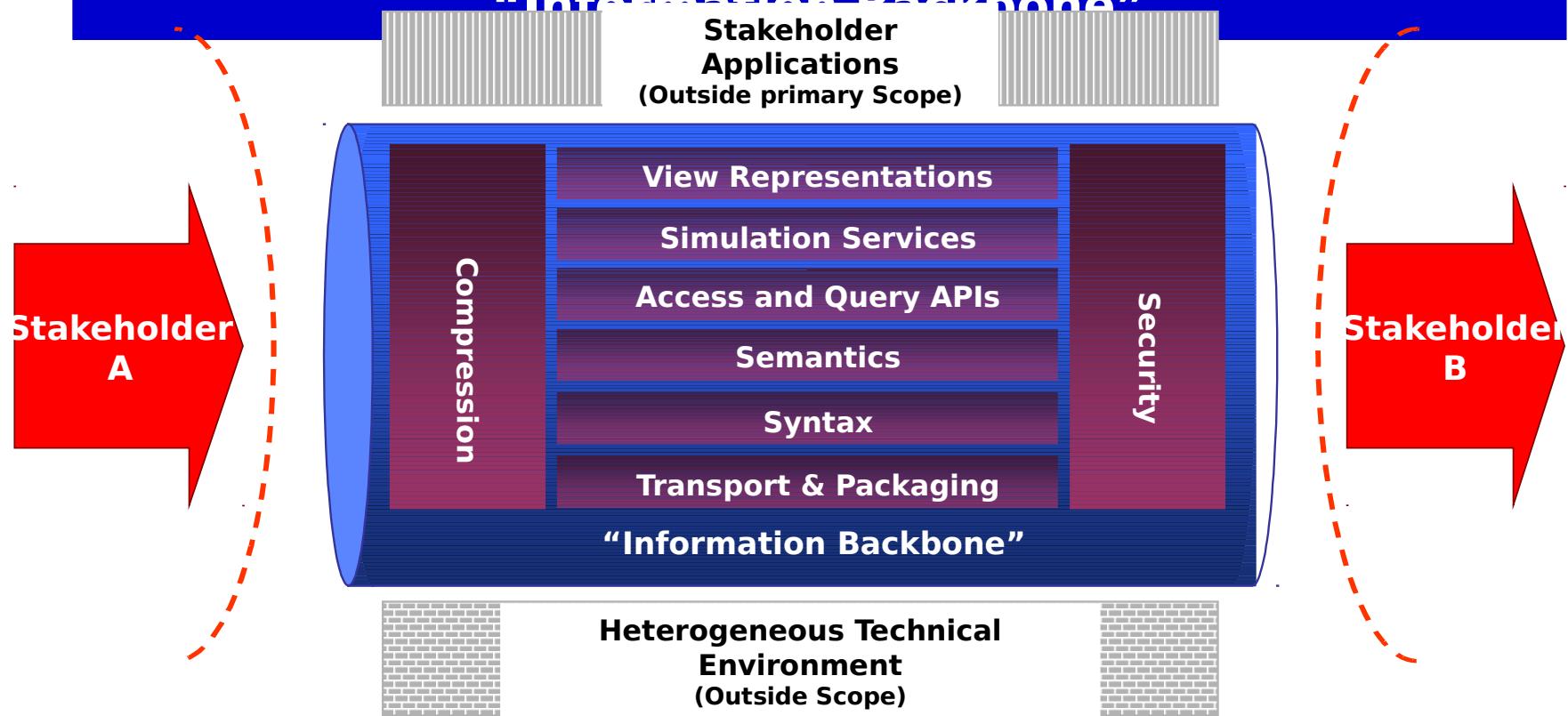


- To realize end-to-end use and interchange of SoS architecture models across all value-chains, there must be
  - A minimal, but extensible schema that all COIs adopt
  - A modular, open and broadly accepted framework to effectively fit together or for plugging-in the various architecture model services
    - Create, store, visualize, query, assemble (or compose), exchange, use, interpret, analyze, execute (or simulate), verify and secure

# Technical Framework for Architecture Modeling

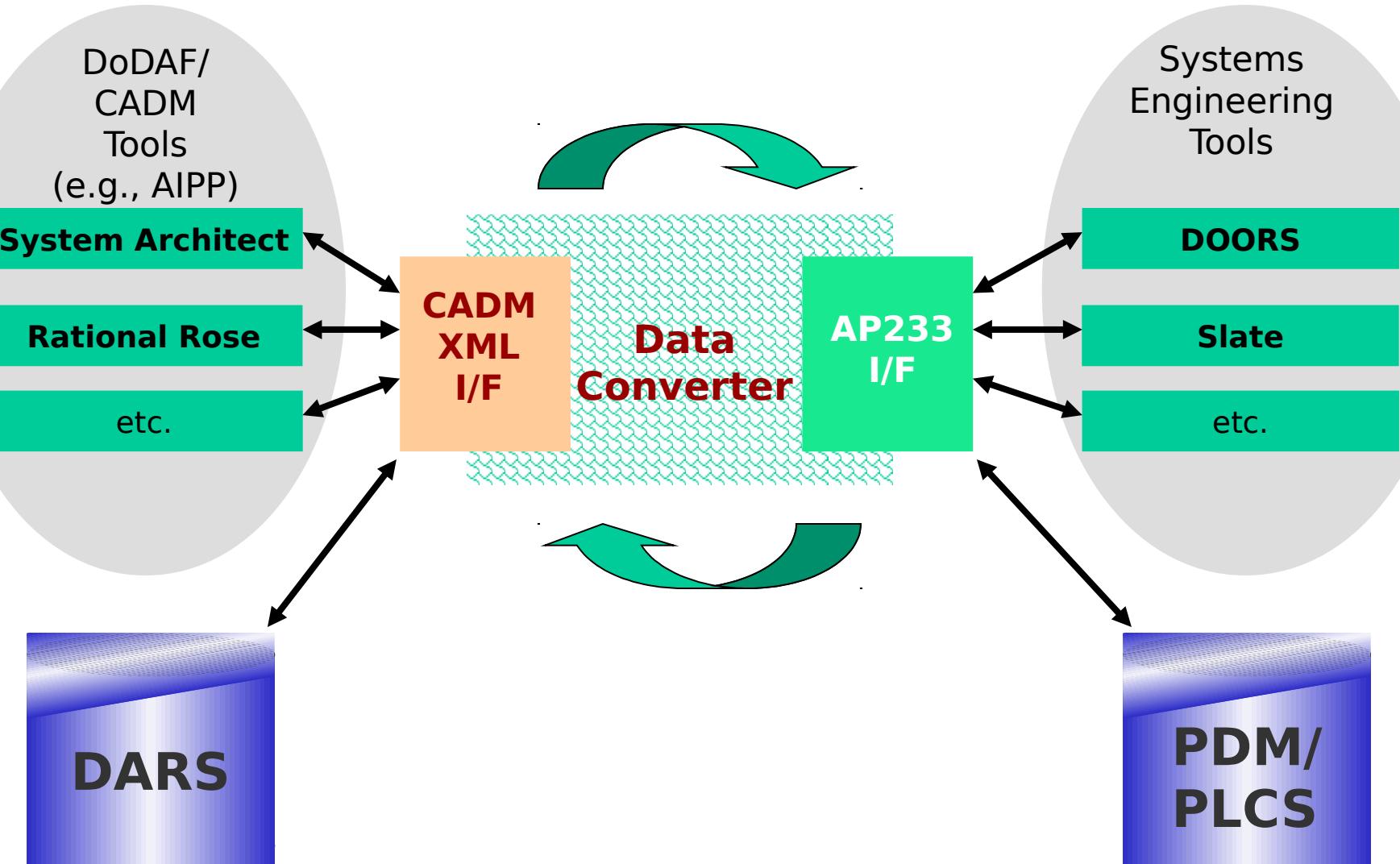
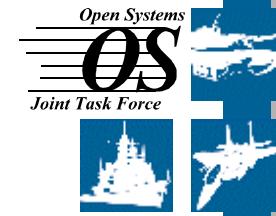


Defines scope and generic services needed to collaborate using SoS architecture models over an “Information Backbone”



A Framework for Linking  
Value-chains

# Example Standards-based Architecture Data Interchange Scenario



# Supporting Vision of Flexible Systems



Module Replacement or Upgrade  
Littoral Combat Ship One Push three Missions  
Scenario Only possible with an Open Systems Approach



Mine Warfare

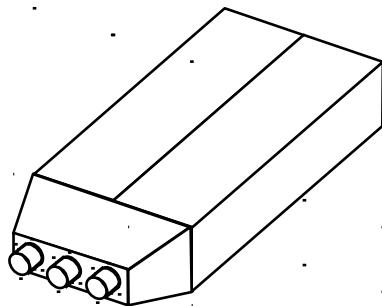


Littoral Surface Warfare

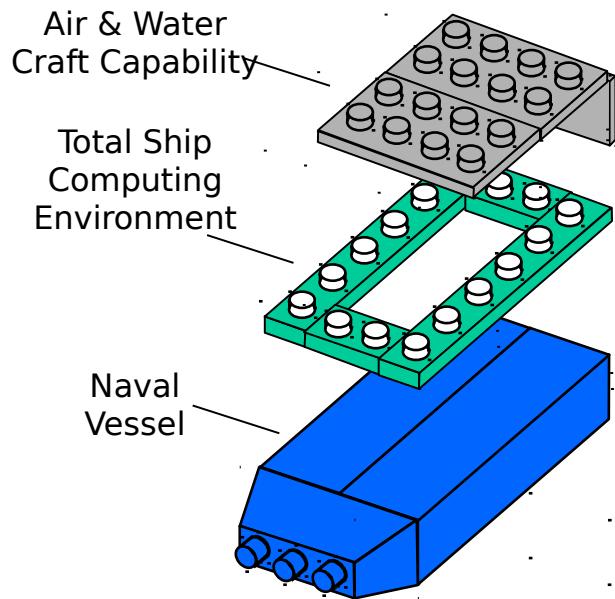


Littoral ASW Warfare

# Building a Seaframe

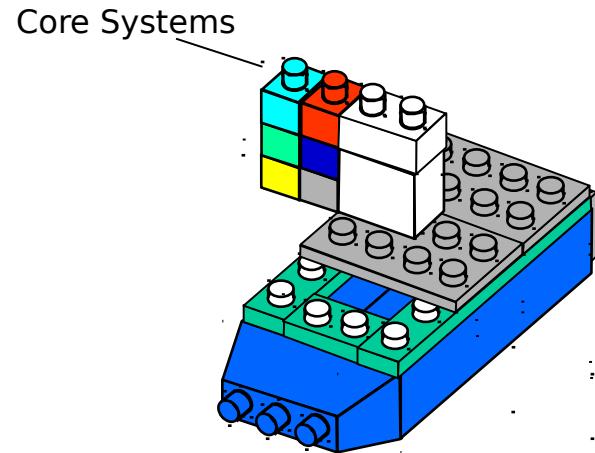


**COMMERCIAL VESSEL**



**SHIP SYSTEM**

- Open Ocean certification
- 30 year service life
- Level I Survivability
- Selected additional survivability features
- Damage Control features
- Magazines & ordnance handling capability
- Reduced signature
- Increased Endurance
- Propulsion Flexibility/redundancy
- Increased Electrical generating capacity
- Aviation capability
- Watercraft capability
- Payload handling capability
- UNREP capability
- TSCE infrastructure
- Mission Module Interfaces

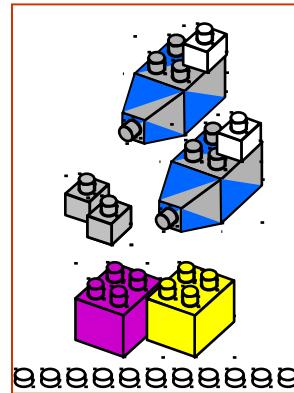
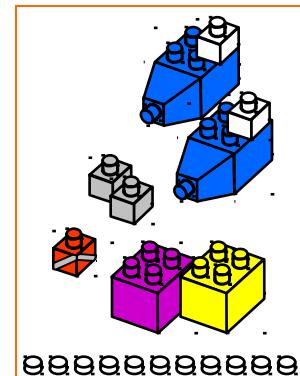
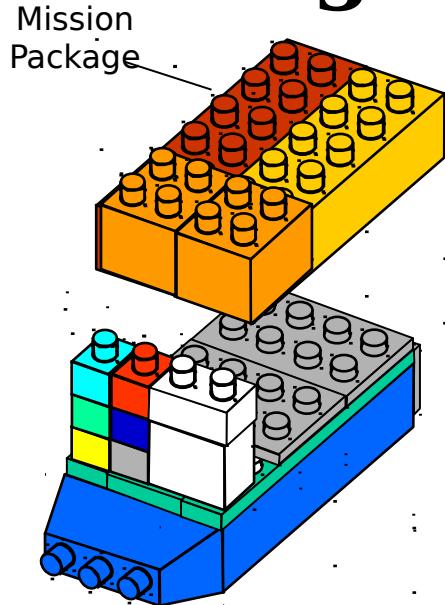
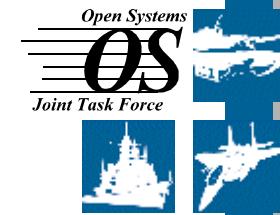


**SEAFRAME**

- Self defense capability
  - Air
  - Surface
  - Subsurface
  - AT/FP
- FORCENet capability
- Combat Management System
- Offboard vehicle control system
- Air control capability

+ **CORE CREW**

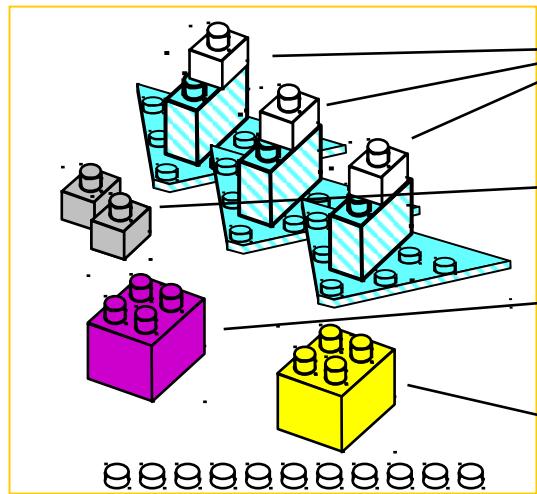
# Building a Mission Package



## ***MIW Example***

### **Mission Module**

### **Mission Systems**

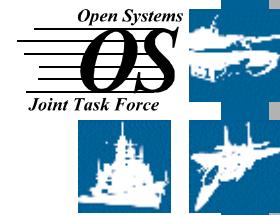


### **Mission Module**

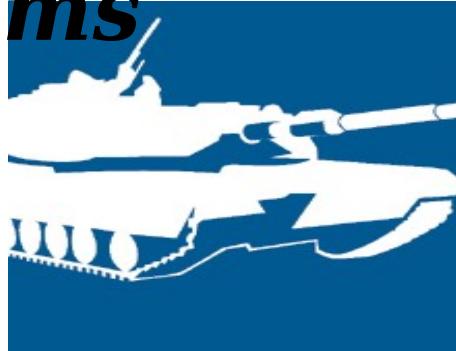
### **Mission Module**

# *Open Systems Joint Task Force* **(OSJTF)**

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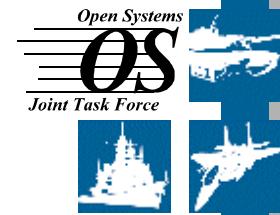


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*Joint Task*  
**Force**

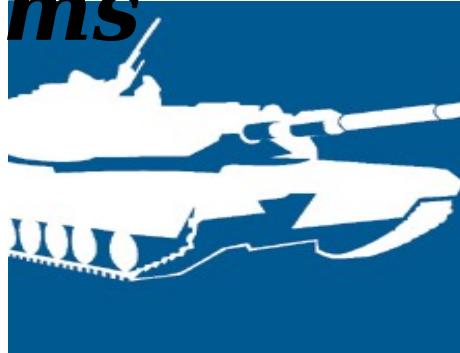


*Questions?*

# Weapons Systems Standards

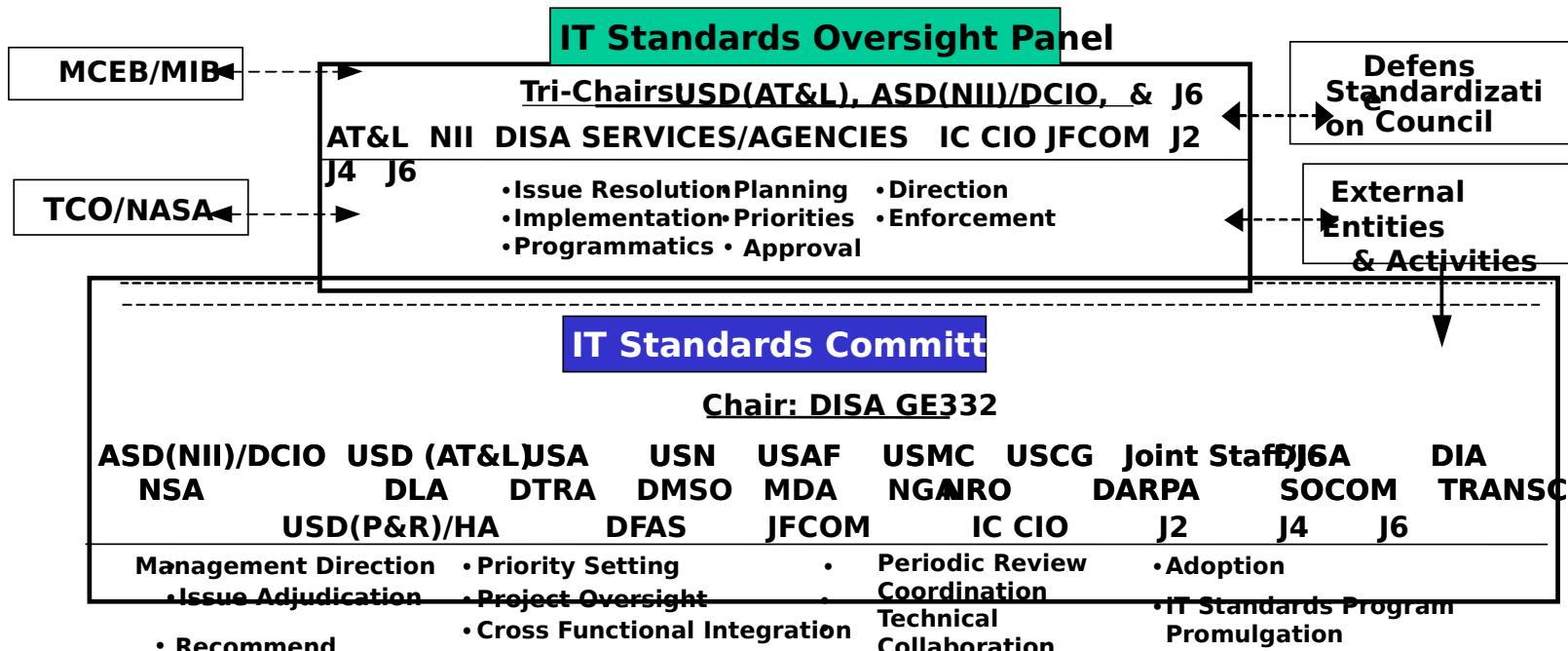
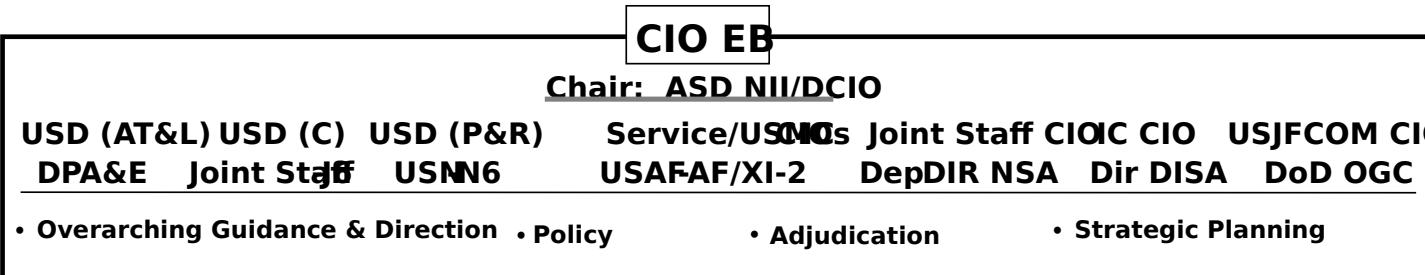


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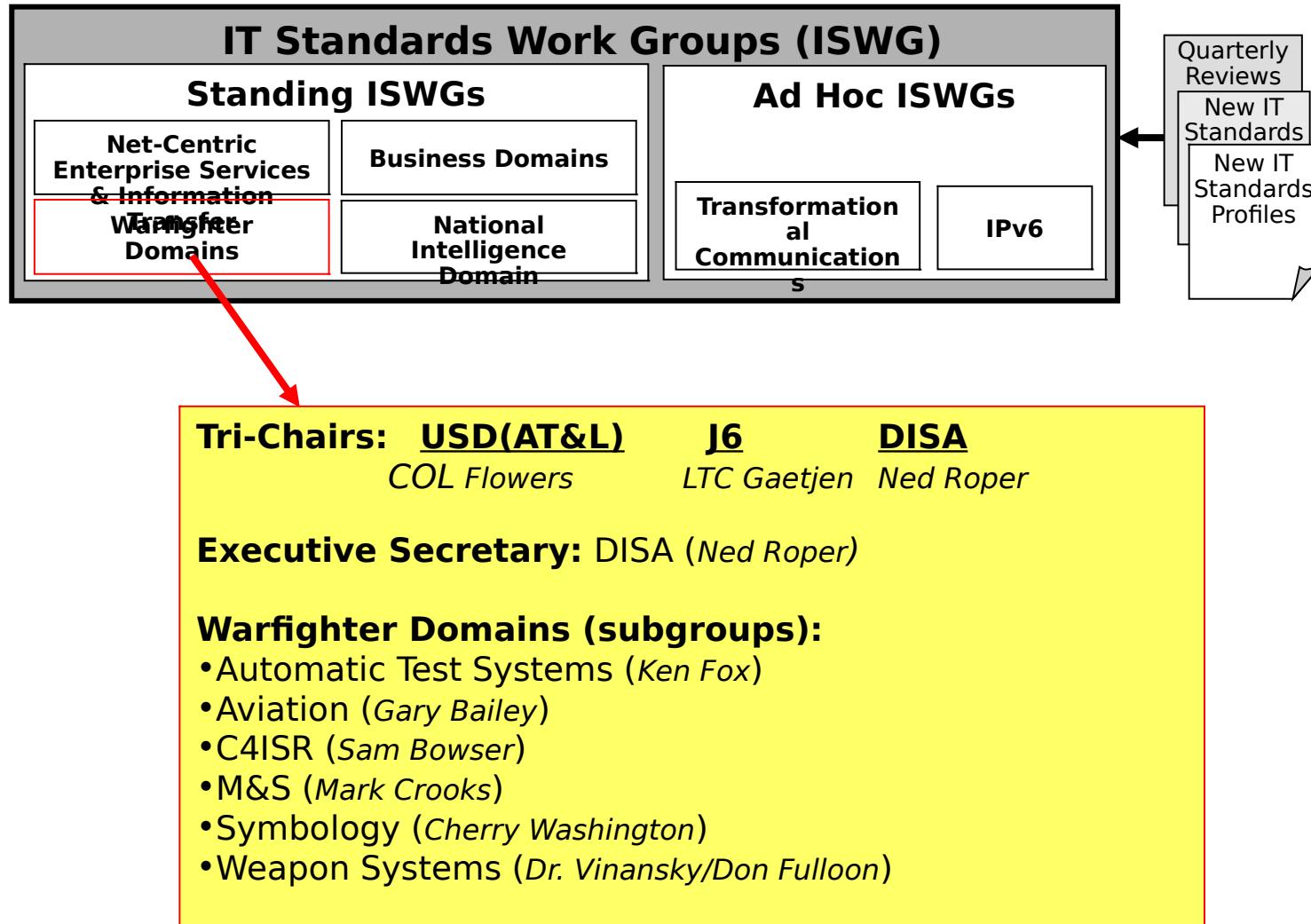


*Dan Feliciano*

# IT Standards Governance Membership



# Warfighter Domain - MOSART Influence



# Weapon Systems Working Group Standards Candidate List

## 04-2.0 Period Standards



#	Standard ID	Standard Title	Primary Owner
1	Map Data Loading Standard (MDLS)	Map Date Loading Standard (MDLS), Revision 1.0, February 26	Weapon Systems
2	DoD AIMS 03-1000	DoD AIMS 03-1000 Mark XIIIA	Weapon Systems
3	IEEE-1386.1	Common Mezzanine Card Family: CMC and Physical and Environmental Layers for PCI Mezzanine Cards: PMC, 2001.	Weapon Systems
4	Weapon System Mapping Services (WSMS) API	Weapon System Mapping Services (WSMS) Application Programmer's Interface (API), WSTA-AS-03-01, January 28, 2001.	Weapon Systems
5	DoD AIMS 97-1000	97-1000 Mark XII/Mode	Weapon Systems
6	SAE (AADL) AS5506	Architecture Analysis and Design Language (AADL) AS5506, Version 0.98, March 17, 2004	Weapon Systems (Missile Sys - Mel Bartlett)
7	USA WSHCI V3	USA WSHCI V3 - Proposal to Mandate standard USA WSHCI v3	Weapon Systems
8	EBR-1553/MMSI SAE AS-1A2	Enhanced Bit-Rate 1553(EBR-1553)/MMSI SAE AS-1A2 Task Group Specification, July 2003.	Weapon Systems
9	Weapon System Mapping Services (WSMS) API	Weapon System Mapping Services (WSMS) Application Programmer's Interface (API), WSTA-AS-03-01, October 2001.	Weapon Systems
10	IEEE 1394a	High Performance Serial Bus, Attachment 1, 2000.	Soldier Support
11	IEEE 1394b	IEEE 1394b High Performance Serial Bus, 2001	Soldier Support
12	ANSI/VITA 1.1	VME64 Extensions, 1997.	Missile Systems
13	ANSI/AIAA R-004	Recommended Practice for Atmospheric and Space Flight	Missile Systems

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15	MIL-STD-1553B	Medium Speed System Network Bus, 21 September 1987, with Notice of Change 1, 12 February 1980, Notice of Change 2, 8 September 1986, Notice of Change 3, 31 January 1993, and Notice of Change 4, 15 January 1996.	Missile Systems
16	IEEE 1076.2	VHDL Mathematical Package, 1996.	Weapons Systems
17	LVDS	Electrical Characteristics of LVDS Interface Circuits, March 1996.	Soldier Support
18	IEEE 1386.1	Common Mezzanine Card Family: CMC and Physical and Environmental Layers for PCI Mezzanine Cards: PMC, 2001.	Weapons Systems
19	ATSC Document A/53	ATSC Digital Television Standard, 16 September 1995.	Weapons Systems
20	IEEE 1076.3	Standard VHDL Synthesis Packages, 1997.	Weapons Systems
21	ISO/IEC 9945-1:Real-time	Portable Operating System Interface (POSIX) - Part 1: System Application Program Interface (API) [C language], 1996 (Real-time Optional Services).	Application
22	Linux 1.2	Linux Standard Base Specification 1.2, Free Standards Group, 2002	Application
23	OMG UML v1.4	Object Management Group (OMG) Unified Modeling Language (UML) Specification, Version 1.4, September 2001.	Application
24	Linux 1.2 IA32	Linux Standard Base Specification for the IA32 Architecture 1.2, Free Standards Group, 2002	Application
25	ISO/IEC 9945-1:Thread	Portable Operating System Interface (POSIX) - Part 1: System Application Program Interface (API) [C language], 1996 (Thread Optional Services).	Application

# Weapon Systems Working Group Standards Candidate List

## 04-2.0 Period Standards

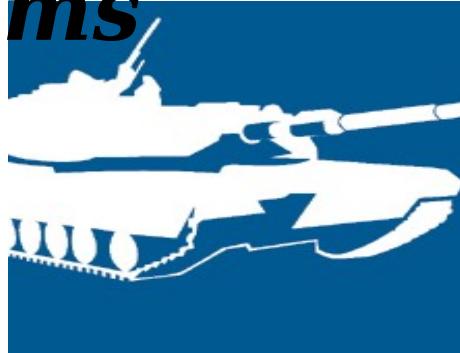


#	Standard ID	Standard Title	Primary Owner
27	ISO/IEC 9945-2	Portable Operating System Interface (POSIX) - Part 2: Shell and Utilities, 1993.	Application
28	P1003.1q d8	Portable Operating System Interface (POSIX) Part 1: System Application Program Interface (API) - Amendment x: Tracing [C Language], Draft 8, April 2000.	Application
29	ISO/IEC 9945-1	Portable Operating System Interface (POSIX) - Part 1: System Application Program Interface (API) [C language], 1996 (Mandated Services).	Application

# Assessment Schedule

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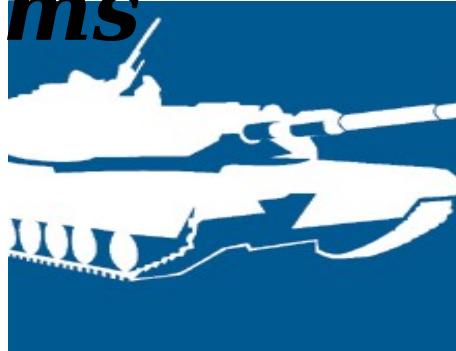


*LT Col Telford*

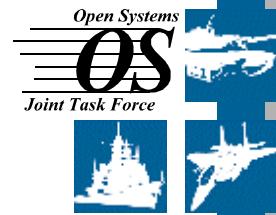
# Enhanced Fighting Vehicle - PM Feedback



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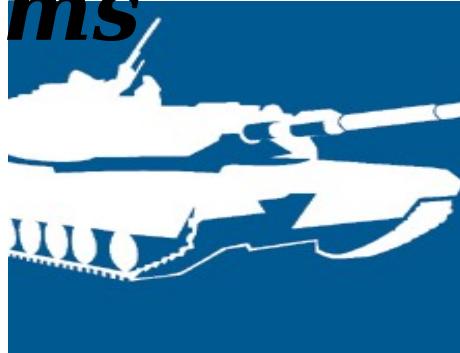


*PM EFV*



# Navy Open Architecture Policy

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# AF/XI C4ISR Flight Plan Expansion Update

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